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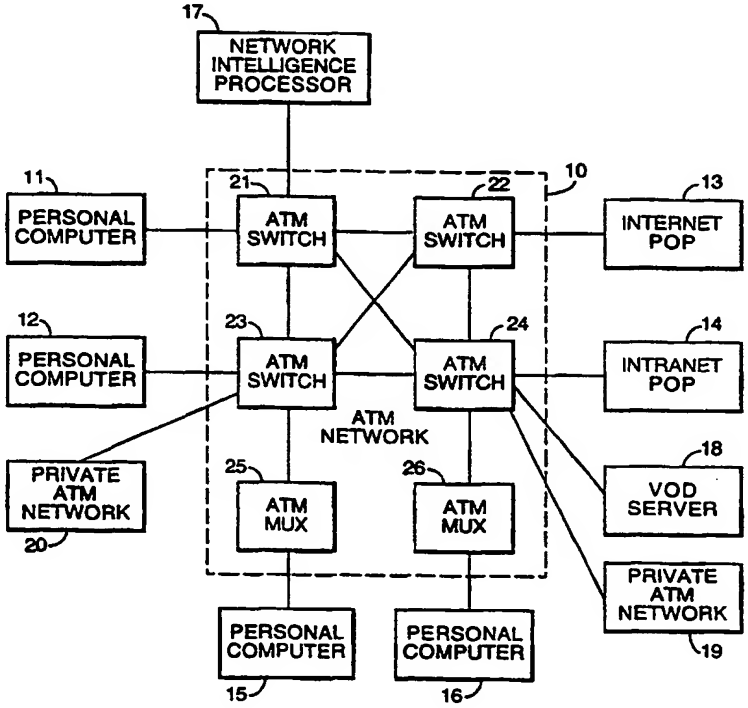
(54) Title: METHOD AND SYSTEM FOR REQUESTING A VIRTUAL CIRCUIT THROUGH A PACKET SWITCHED NETWORK

(57) Abstract

There is described a method for establishing a virtual circuit through an ATM network (10) between a calling terminal, for example, a personal computer (11), and a called terminal, for example, Internet point of presence (13). In this example, the calling terminal is equipped to use one user–network signalling protocol and the network (10) is equipped to use another user–network signalling protocol. In order to establish the virtual circuit, the calling terminal sends a call set–up request message in its user–network signalling protocol through the network (10) to a network intelligence processor (17). The network intelligence processor (17) then converts the call set–up message into the user–signalling protocol used by the network (10). It then transmits the converted call set–up message to the network (10) and the requested circuit is the established.



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METHOD AND SYSTEM FOR REQUESTING A VIRTUAL CIRCUIT THROUGH A PACKET SWITCHED NETWORK

This invention relates to a method of requesting a virtual circuit between a calling terminal and a destination terminal through a packet switched network and also to a processing system for requesting a virtual circuit in a packet switched network.

In one method of establishing a virtual circuit through a packet switched network between a calling terminal and a destination terminal, the calling terminal transmits a call set-up request in a signalling protocol to the network. The network then establishes the requested virtual circuit. There are already several signalling protocols which can be used by terminals for this purpose. Consequently, if a terminal equipped to send call set-up messages in one signalling protocol is connected to a network which uses another signalling protocol, call set-up messages sent by the terminal will not be suitable for requesting virtual circuits in the network.

According to one aspect of this invention, there is provided a method of requesting a virtual circuit between a calling terminal and a destination terminal through a packet switched network, said method comprising the steps of:

transmitting a call set-up request in a first signalling protocol from a calling terminal through said network to a processing system connected to said network, said call set-up request being a request for a virtual circuit between the calling terminal and a destination terminal;

converting the call set-up request in the first signalling protocol into a call set-up request in a second signalling protocol in the processing system; and

transmitting the call set-up request in the second signalling protocol from the processing system to said network.

With this invention, where the user of a terminal equipped to operate with the first signalling protocol wishes to establish a virtual circuit between the terminal and another terminal through a network which operates according to another signalling protocol, the call set-up request from the terminal can be translated into the appropriate signalling protocol for the network.

In this specification, the term "terminal" should be interpreted to include another network.

According to a second aspect of this invention, there is provided

a processing system for requesting a virtual circuit between a calling terminal and a destination terminal through a packet switched network, said system being arranged to:

receive a call set-up request in a first signalling protocol from a calling terminal, said call set-up request being a request for a virtual circuit between a calling terminal and a destination terminal;

convert a call set-up request in the first signalling protocol into a call set-up request in a second signalling protocol; and

transmit a call set-up request in the second signalling protocol to the network.

According to a third aspect of this invention, there is provided a processing system for requesting a virtual circuit between a calling terminal and a destination terminal through a packet switched network, said system comprising:

an interface for receiving a call set-up request in a first signalling protocol from a calling terminal;

a translator for translating a call set-up request in the first signalling protocol for a virtual circuit between a calling terminal and a destination terminal into the network addresses of the calling terminal and the destination terminal; and

a signalling agent for establishing a call set-up request in a second signalling protocol from the network addresses of a calling terminal and destination terminal and transmitting the call set-up request in the second signalling protocol to said network.

This invention will now be described in more detail, by way of example, with reference to the drawings in which:

Figure 1 is a block diagram of a public ATM network and a set of terminals connected to the public ATM circuit, together with two private ATM networks and a network intelligence processor which are also connected to the public ATM network, which illustrate an embodiment of this invention;

Figure 2 is a block diagram illustrating the main components of a computer;

Figure 3 is a block diagram of some of the software components of the network intelligence processor shown in Figure 1; and

Figure 4 is a flow chart illustrating the sequence of operations which are performed in setting up a virtual circuit through the ATM network of Figure 1.

Referring now to Figure 1, there are shown a public ATM network 10, a set of terminals 11 to 16 and 18 connected to the network 10 and a processing system in the form of a network intelligence processor 17 which is also connected to the network 10. Figure 1 also shows a pair of private ATM network 19, 20 connected to the ATM network 10.

The ATM network 10 comprises four fully interconnected switches 21 to 24 and two multiplexer/demultiplexers 25 and 26 connected, respectively, to ATM switches 23 and 24. In the present example, all four switches 21 to 24 function as access switches. The ATM network 10 in Figure 1 is a relatively simple ATM network in that it has only four switches, each of which is an access switch. The invention may, of course, be used in an ATM network having a much larger number of switches. In a larger network, some of the access switches may be interconnected by other switches which do not function as access switches. As is well known, an ATM network is a packet switched network in which individual packets take the form of 53 byte cells. Each cell has a five byte header and a 48 byte payload. In each cell the header includes routing information in two fields known as the virtual path identifier (VPI) and the virtual channel identifier (VCI) fields. Often, but not necessarily, the VPI field of a cell provides a coarse level of routing while the VCI field provides a fine level of routing.

As the cell travels between an originating terminal and a destination terminal, the VPI and VCI fields are set to initial values before the cell passes through the ATM input interface. The ATM interface may be, for example, the ATM card in a personal computer. Then, at each switch between the ATM input interface and the ATM output interface, the VPI and/or VCI fields are read and the output port is selected in accordance with the values of one or both of these fields using the routing table contained in the switch. Before forwarding the cell on to the selected output port, the values of one or both of these fields are updated. When a cell passes through a multiplexer/demultiplexer in the demultiplexing direction, routing is controlled in a similar manner.

For a particular connection between two terminals the routing tables are established before call commencement. Consequently, during a call, two terminals are connected by a virtual circuit. During call set-up of a virtual circuit, the values of the routing tables for the switches and multiplexer/demultiplexers used in the

virtual circuit and the initial values of the VPI and VCI fields can be established by network management or by signalling processes.

When a virtual circuit is established by using signalling processes, call set-up commences with an originating terminal sending a call set-up request for the virtual circuit to the network using a user-network signalling protocol. The request is carried in ATM cells between the originating terminal and the network on a signalling virtual channel. Within the network, the requested virtual circuit is established by signalling messages which use a network signalling protocol and pass between nodes (switches and multiplexer/demultiplexers) in ATM cells. Between the network and destination node, signalling messages in the user-network protocol are also carried in ATM cells over a signalling virtual circuit.

Referring again to Figure 1, the terminals 11, 12 and 15 are personal computers, the terminal 16 is a set-top box for a television set, the terminal 18 is a video-on-demand (VoD) server, the terminal 13 is an Internet point of presence (POP) and the terminal 14 is an intranet POP.

There are various possibilities for connecting the personal computer 11 to the ATM switch. The connection may be provided by way of a dedicated access line, for example, a twisted copper pair or optical fibre. As another possibility, the computer 11 could be connected to a local area network (LAN) and the LAN could then be connected to an ATM switch 21 via a router. As a further possibility, the computer 11 may have a dial-up integrated services digital network (ISDN) connection to the ATM switch 21. As yet another possibility, the computer 11 may be connected to the ATM switch 21 through a telephone line formed from a twisted copper pair but with the addition of the technology known as Asymmetric Digital Subscriber Loop (ADSL). As is well known, where an access line uses ADSL technology, electronic devices at each end of the line co-operate to provide a data transmission channel in addition to an ordinary telephone channel. In one version, the data channel can deliver 1.5 Mbit/s downstream in addition to 16 kbit/s in the upstream direction. These connection possibilities also apply to the personal computers 12 and 15.

As the set-top box 16 is designed to receive video data, the connection between it and the ATM multiplexer must be capable of delivering data at a relatively high bandwidth. Thus, this connection may take the form of optical fibre or a twisted copper pair provided with ADSL technology.

The connections between the POPs 13, 14, the VoD server 18 and the private networks 19, 20 and their associated ATM switches 22, 24 in the public ATM network 10 can take the form of high bandwidth dedicated links provided, for example, by optical fibre or co-axial cables.

The network intelligence processor 17 is connected through a dedicated link to the ATM switch 21.

Each of the personal computers 11, 12 and 15 is of conventional construction and the hardware of one of these computers is shown diagramatically in Figure 2. As shown in Figure 2, the computer comprises a central processing unit (CPU) 40, data storage devices 41, visual display unit (VDU) 42, a keyboard 43 and input/output ports 44. Storage devices 41 are of conventional form and comprise random access memory ((RAM), read only memory (ROM), a hard disk and a floppy disk. The software applications which control the computer are stored in the storage devices 41.

The software applications include a communications application which permits the computer to transmit and receive packets using the well-known TCP/IP protocols. Thus, the computer can communicate with terminals connected to the public Internet or to private intranets. In order to permit the computer to communicate with the ATM network 10, it is provided with an ATM card 45 and an associated software application. The ATM card 45 together with a software application segments outgoing data packets into ATM cells and re-assemble incoming ATM cells into IP data packets.

As is well known, in addition to using the TCP/IP protocols, information transfer between Internet or intranet clients and servers can also use higher level protocols. In the World Wide Web (or, simply, the Web) service, information is stored as HyperText Mark-Up Language (HTML) pages and information is transferred using the HyperText transfer protocol (HTTP). An Internet server which can supply information using the Web service is known as a Web server and an Internet client which can access such information is known as a Web client. In order to access information using the Web service, the Web client is provided with a software application known as a Web browser. A Web browser interprets and displays information which it receives for display on the computer's VDU. A Web browser specifies information that it wishes to retrieve using a Uniform Resource

Locator (URL). In each of the computers 11, 12 and 15, the software applications include a Web browser.

The set-top box 16 can be connected to a television set to display video programmes retrieved by the set-top box 16 from Internet servers and VoD servers. The components of the set-top box 16 include a video demodulator unit, a video decompression unit and a video demodulator and also a microprocessor for controlling the other components. In addition, the set-top box 16 includes a Web browser, an ATM card and the associated software application, and also the software application needed to permit it to receive data using the TCP/IP protocols. The Web browser in the set-top box 16 may be a cut-down version of a Web browser suitable for a computer.

The POP 13 is configured to permit data transmission between the ATM switch 22 and the public Internet. Similarly, the POP 14 is configured to permit data transmission between the ATM switch 24 and a private intranet.

Although the computer 11, 12, 15 and the set-top box 16 are equipped to use the Web service, they could alternatively, or in addition, be equipped to use another higher level protocol service.

The VoD server 18 has an ATM card and associated software application.

The network intelligence processor 17 is also constructed as a computer and has the same general construction as the computer shown in Figure 2. It also includes an ATM card and an associated software application to permit it to send and receive data from the ATM network 10. As shown in Figure 3, the software applications include a signalling interface 50, a translator 51 and a proxy signalling agent 52. The function of these components will be described below. By way of modification the network intelligence processor 17 may take the form of a group of individual computers arranged to communicate with each other.

Each of the terminals 11, 12, 15 and 16 is provided with a virtual signalling channel to the network intelligence processor 17. These channels are established by the routing tables in the ATM switches 21 to 24 and the multiplexer/demultiplexers 25 and 26. Each of the terminals 11, 12, 15 and 16 stores the initial VPI and VCI values which are needed to access the virtual signalling channel to the network intelligence processor 17.

As mentioned above, in one method of establishing a virtual circuit through an ATM network, an originating terminal sends a call set-up request to the

network using a user-network protocol. Several user-network signalling protocols have already been established. Examples of these are the ATM-F UNIv3.0, 3.1 and 4.0 protocols established by the ATM Forum, the ITU-T Q.2931 protocol established by the International Telecommunications Union, the IETF RSVP protocol established by the Internet Engineering Task Force and also several proprietary user-network signalling protocols. In the example shown in Figure 1, each of the terminals 11, 12, 15 and 16 is equipped to send call set-up messages using a proprietary signalling protocol. The ATM network 10 is equipped to interpret call set up messages from terminals in the ATM-F UNIv4.0 user-network signalling protocol. The ATM network is not equipped to interpret call set-up messages in proprietary protocols.

In the invention, in order to establish a virtual circuit between a calling terminal and a destination terminal, the calling terminal, for example, terminal 11, transmits a call set-up request in its user-network proprietary signalling protocol (the input protocol) to the network intelligence processor 17. In the network intelligence processor 17, the call set-up request is then converted from the input user-network signalling protocol into the ATM-F UNIv4.0 signalling protocol. It then transmits a call set-up request using this protocol to the network 10. The requested virtual circuit is then established. This method of establishing a virtual circuit will now be described with reference to the flow chart shown in Figure 4.

In an initial step 100, when the user of a calling terminal, for example, personal computer 11, wishes to establish a virtual circuit to a destination terminal, for example, POP 13, the calling terminal sends a call set-up request to the signalling interface 50 of the network intelligence processor 17. This request is sent over its signalling virtual circuit. The call set-up request is in the user-network signalling protocol used by the terminal, for example, the proprietary signalling protocol used by the personal computer 11.

Then, in a step 101, the signalling interface 50 passes the call set-up request to the translator 51.

Next, in a step 102, the translator 51 identifies the information required by the network 10 to establish the requested virtual circuit. The translator 51 is capable of identifying this information in a set of user-network protocols, including the various user-network protocols mentioned above. It is also capable of translating signalling messages between these protocols. This information includes

the addresses of the calling and destination terminals and also transmission options, such as quality of service and cell transmission rate. In a step 103, the translator 51 passes this information to the proxy signalling agent 52.

Using this information, in a step 104, the proxy signalling agent 52 sends a call set-up request to the network 10 over a dedicated signalling channel. This call set-up request is in the ATM-F UNIv 4.0 user-network signalling protocol.

In a step 105, the network 10 establishes the requested virtual circuit. While the network 10 is establishing the requested virtual circuit, it may pass information on the status of the configuration to the proxy signalling interface 52. Using the translator 51 and the signalling interface 50, this information can be passed back to the calling terminal, for example personal computer 11, after conversion into the user-network signalling protocol used by the calling terminal.

Also, while the network 10 is establishing the requested virtual circuit, it passes signalling messages to the destination terminal. If the destination terminal is not equipped to receive messages in the ATM-F UNIv 4.0 signalling protocol, these messages can be passed to the network intelligence processor 17 for conversion into the protocol used by the destination terminal. After conversion, each message is passed to the destination terminal.

When the virtual circuit has been established, the network 10 sends a message confirming this to the proxy signalling agent 52 in a step 106. The confirmation message includes the initial VPI and VCI values required by the calling terminal.

Finally, in a step 107, the proxy signalling agent 52 sends a message to the translator 51 stating that the requested virtual circuit has been established and giving the VPI and VCI values. The translator 51 then prepares a message in the proprietary user-network signalling protocol used by the calling terminal and containing confirmation that the circuit has been established and the initial VPI and VCI values. In a step 107, this message is transmitted by the signalling interface 50 to the calling terminal.

Although the invention has been described, in the above example, with reference to a calling terminal which uses a proprietary user-network signalling protocol and an ATM network which uses the ATM-F UNIv 4.0 signalling protocol, it is to be appreciated that the invention is suitable for use in any arrangement

where a calling terminal uses a user-network signalling protocol and it is connected to a network which uses another user-network signalling protocol.

In the example described above, the network intelligence processor 17 converts signalling messages between user-network signalling protocols. By way of modification, the network intelligence processor 17 could also be arranged to convert signalling messages between network-network signalling protocols. For example, if the public ATM network 10 and the private ATM network 19 use different network-network signalling protocols, then the network intelligence processor 17 could be used to convert signalling messages, such as call set-up requests, between the two network-network signalling protocols. In relation to the network 10, other networks connected to it are terminals.

Although this invention has been described with reference to an ATM network, it is to be appreciated that it can also be used in other types of packet switched connection-oriented networks, for example, in a Frame Relay network.

CLAIMS

1. A method of requesting a virtual circuit between a calling terminal and a destination terminal through a packet switched network (10), characterised in that said method comprises the steps of:

transmitting a call set-up request in a first signalling protocol from a calling terminal through said network (10) to a processing system (17) connected to said network, said call set-up request being a request for a virtual circuit between the calling terminal and a destination terminal;

converting the call set-up request in the first signalling protocol into a call set-up request in a second signalling protocol in the processing system (17); and

transmitting the call set-up request in the second signalling protocol from the processing system (17) to said network (10).

2. A method as claimed in claim 1, in which said step of converting the call set-up request comprises:

translating the call set-up request in the first signalling protocol into the network addresses of the calling terminal and the destination terminal; and

establishing the call set-up request in the second protocol from the network addresses of the calling terminal and the destination terminal.

3. A method of requesting a virtual circuit as claimed in claim 1 or claim 2, in which the packet switched network is an asynchronous transfer mode (ATM) network (10).

4. A processing system for requesting a virtual circuit between a calling terminal and a destination terminal through a packet switched network (10), characterised in that said system is arranged to:

receive a call set-up request in a first signalling protocol from a calling terminal, said call set-up request being a request for a virtual circuit between a calling terminal and a destination terminal;

convert a call set-up request in the first signalling protocol into a call set-up request in a second signalling protocol; and

transmit a call set-up request in the second signalling protocol to the network (10).

5. A processing system for requesting a virtual circuit between a calling terminal and a destination terminal through a packet switched network (10), characterised in that said system comprises:

an interface (50) for receiving a call set-up request in a first signalling protocol from a calling terminal;

a translator (51) for translating a call set-up request in the first signalling protocol for a virtual circuit between a calling terminal and a destination terminal into the network addresses of the calling terminal and the destination terminal; and

a signalling agent (52) for establishing a call set-up request in a second signalling protocol from the network addresses of a calling terminal and destination terminal and transmitting the call set-up request in the second signalling protocol to said network (10).

6. A processing system as claimed in claim 4 or claim 5, in which the packet switched network is an asynchronous transfer mode (ATM) network (10).

Fig.1.

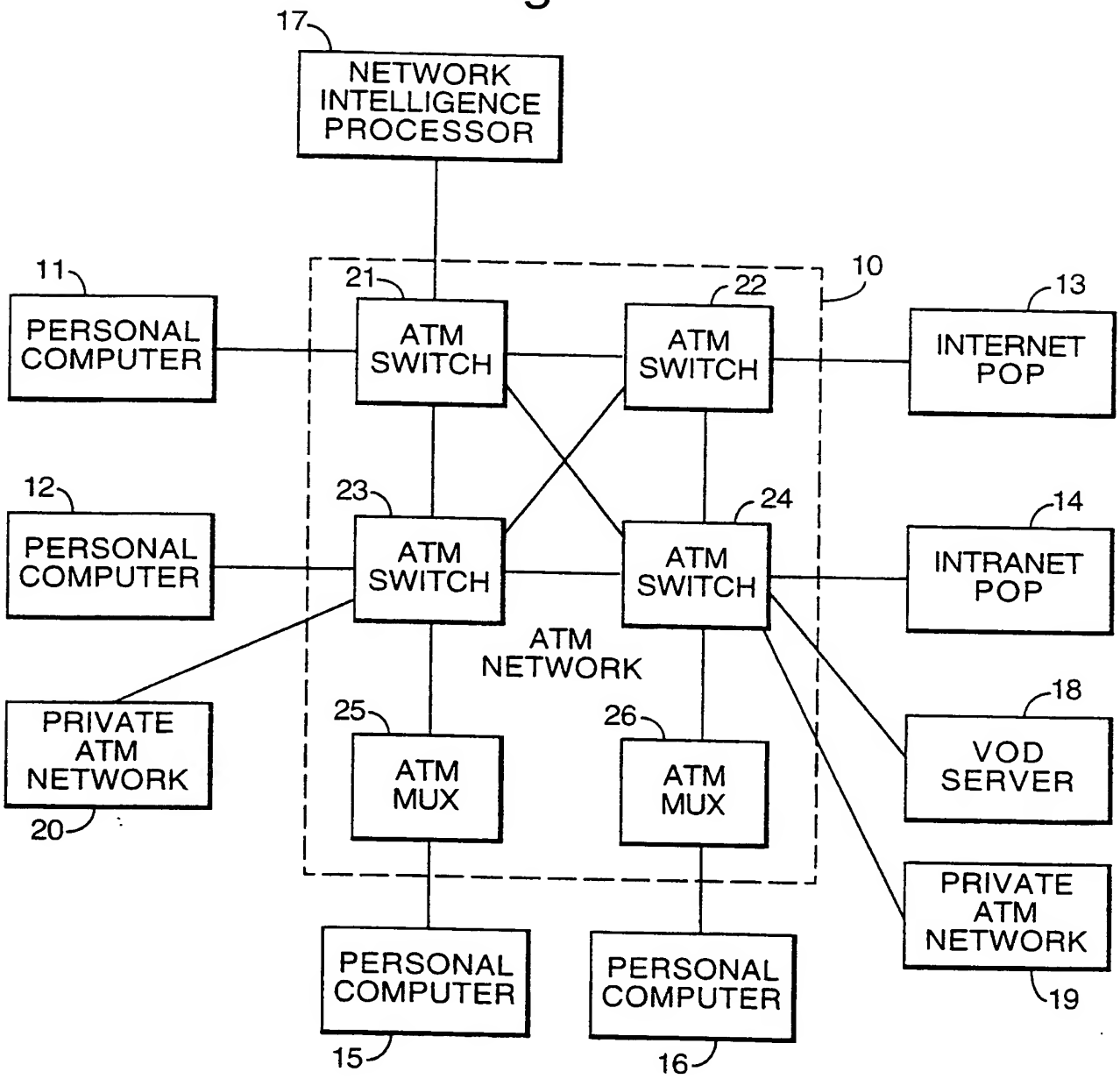


Fig.2.

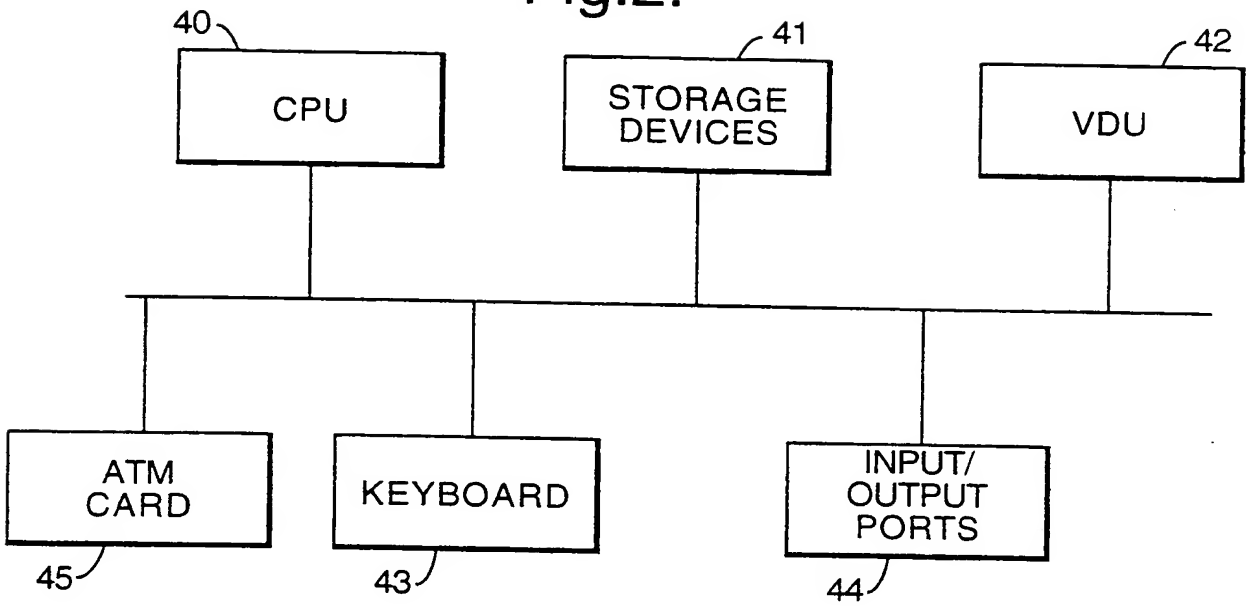


Fig.3.

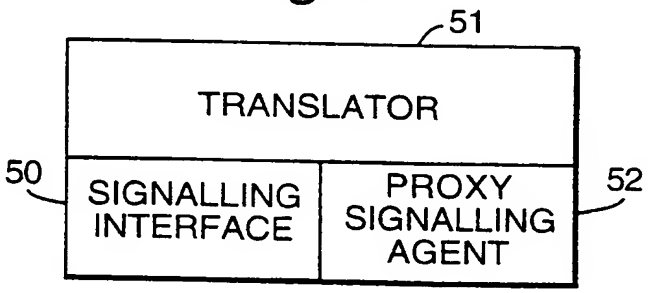


Fig.4A.

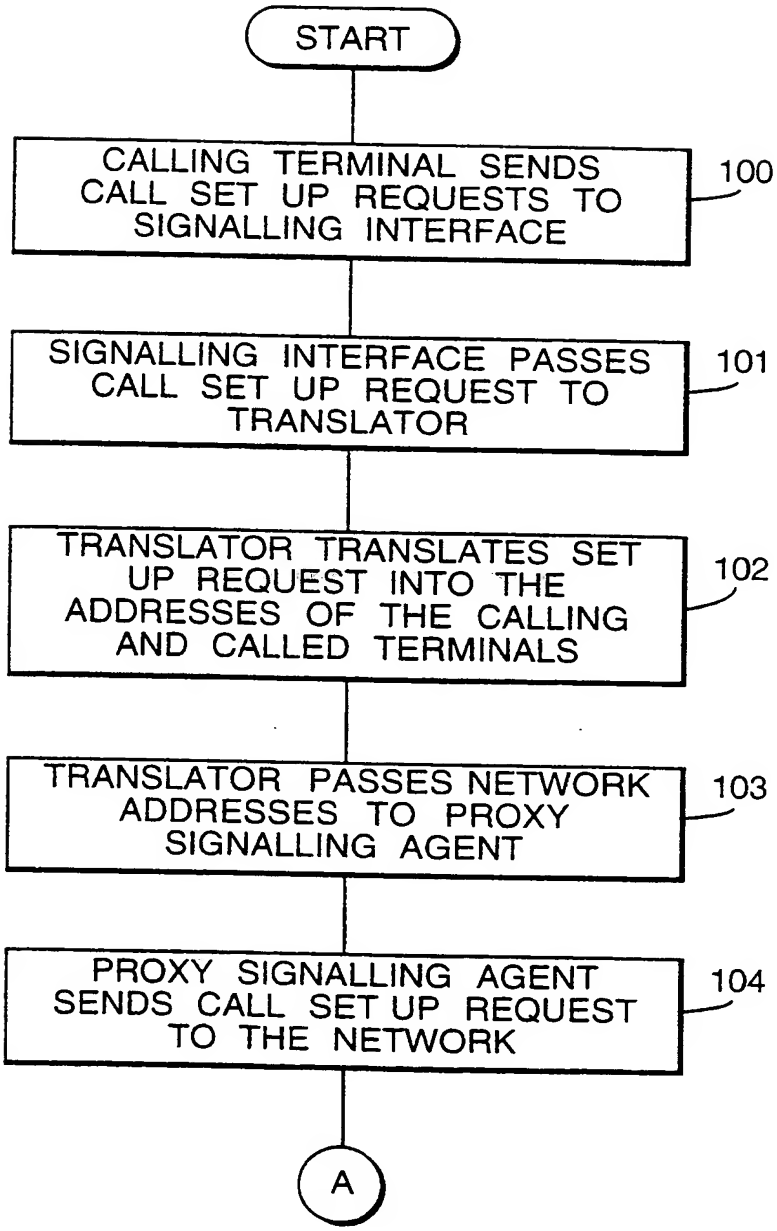
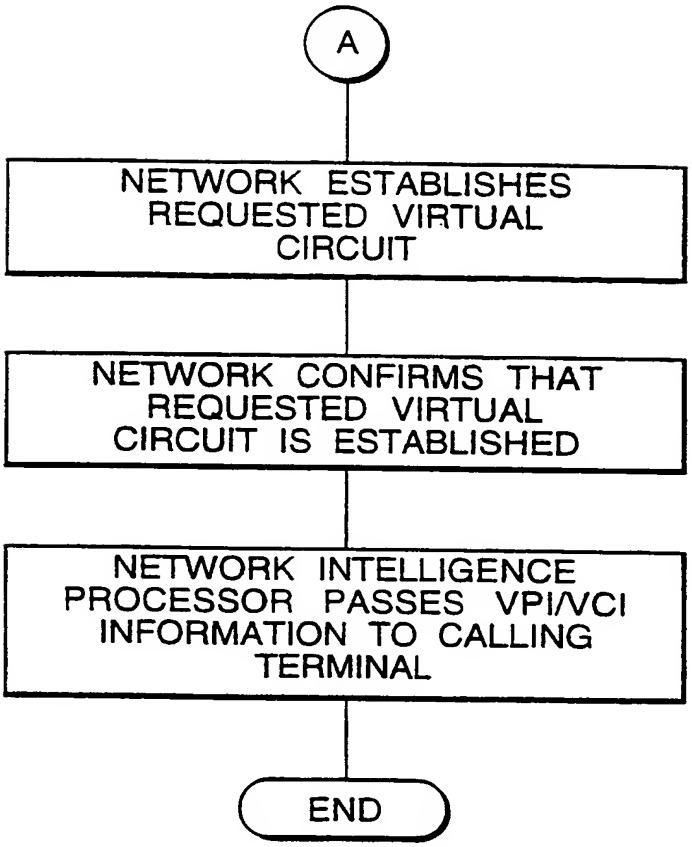


Fig.4B.



INTERNATIONAL SEARCH REPORT

tional Application No
PCT/GB 99/00363

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q11/04 H04L12/66 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 02992 A (TELIA AB ;LARAQUI KIM (SE)) 22 January 1998 see page 2, line 20 - page 4, line 16	1-6
X	WO 97 38537 A (ERICSSON GE MOBILE INC) 16 October 1997 see page 5, line 15 - page 8, line 4	1,2,4,5
Y		3,6

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
27 May 1999	09/06/1999

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CIPRIANI L ET AL: "AN OBJECT ORIENTED IMPLEMENTATION OF A SOFTWARE SIMULATOR FOR B-ISDN SIGNALLING PROTOCOLS" COMMUNICATIONS - GATEWAY TO GLOBALIZATION. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON COMMUNICATIONS, SEATTLE, JUNE 18 - 22, 1995, vol. VOL. 1, 18 June 1995, pages 104-109, XP000532977 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS see paragraph 3.3; figure 4 ---	3,6
A	GB 2 309 619 A (MADGE NETWORKS LTD) 30 July 1997 see abstract -----	1,4

INTERNATIONAL SEARCH REPORT

Information on patent family members

tional Application No
PCT/GB 99/00363

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9802992 A	22-01-1998	SE 9602774 A	16-01-1998
WO 9738537 A	16-10-1997	US 5852660 A	22-12-1998
		AU 2804997 A	29-10-1997
		EP 0894405 A	03-02-1999
		NO 984745 A	09-12-1998
GB 2309619 A	30-07-1997	NONE	